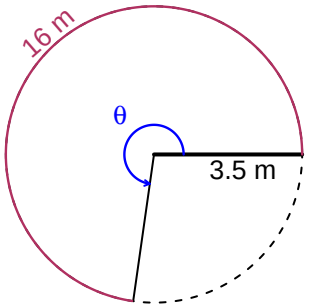
Name: Date:

Trig Final (Solution v35)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 16 meters. The radius is 3.5 meters. What is the angle measure in radians?

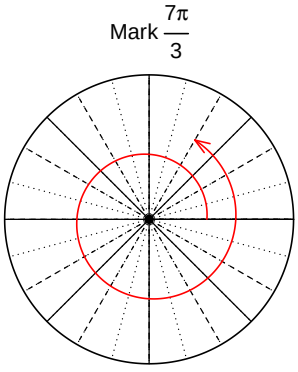


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

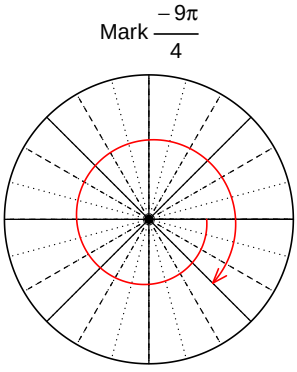
$\theta = 4.571$ radians.

Question 2

Consider angles $\frac{7\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{7\pi}{3}\right)$ and $\sin\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(7\pi/3)$



Find $\sin(-9\pi/4)$

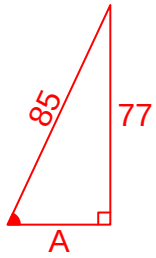
$\cos(7\pi/3) = \frac{1}{2}$

$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{77}{85}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

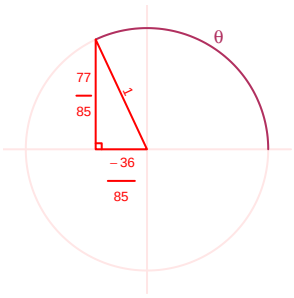
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 77^2 = 85^2$$
$$A = \sqrt{85^2 - 77^2}$$
$$A = 36$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-36}{85}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 6.8 meters, a midline at $y = 3.64$ meters, and a frequency of 8.28 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.8\sin(2\pi 8.28t) + 3.64$$

or

$$y = -6.8\sin(16.56\pi t) + 3.64$$

or

$$y = -6.8\sin(52.02t) + 3.64$$